Instruction Manual 69TM
TM500 Top Load Ceramic
Revised 07/2014

D/F MACHINE SPECIALTIES, INC.

MIG & TIG Welding Products, Consumables & Accessories

1750 Howard Drive, North Mankato, MN 56003
Phone: (507) 625-6200 Fax: (507) 625-6203
Email: sales@dfmachinespecialties.com
www.dfmachinespecialties.com

WATER-COOLED TIG MACHINE BARREL

Model TM500

Code No. 15506 (Barrel Only)
Water-Cooled Nozzle 11147
Uses Ceramic Gas Nozzles

INSTRUCTION, PARTS & SPECIFICATIONS MANUAL

D/F MACHINE SPECIALTIES is a world leader in the design, development, and manufacture of “MIG” (GMAW) & “TIG” (GTAW) welding products, consumables and accessories. D/F offers several types of manual Air or Water-Cooled “MIG” welding tools, and with the increased use of automated and robotic welding systems, a demand has been created for welding tools of the highest quality, durability and interchangeability. For over forty years, D/F welding products have been used extensively on “MIG” and “TIG” welding applications. This experience, coupled with patented design features, unavailable on any other competitive equipment, has made D/F welding tools the most advanced “MIG” and “TIG” welding guns and barrels for semi-automatic, automatic or robotic welding applications.

This Catalog is a guide to helping you select the proper tool for a given semi-automatic, automatic or robotic welding application. The following is only a partial listing of available semi-automatic, automatic and robotic guns. For further information on special “MIG” and “TIG” requirements, please consult the factory.

Customer satisfaction and customer benefits are the center points of all strategic contents

The spirit of the D/F Machine Specialties personnel is to listen to and to integrate the customer throughout the process, to develop and design marketable products, to present prototypes, to carry out pilot tests and to prepare for and be open to new technology and tasks. We attract and carefully select talented individuals who share our values. Together we will nurture and sustain a work environment with two-way communication, training, mentoring, and rewarding career opportunities.

Commitment to excellence

At D/F Machine Specialties we commit to design, build and deliver premium products and superior customer support to quality driven welding professionals. Customers still to this day choose D/F over competitors because of our responsiveness and flexibility. Customers will continue to choose D/F tomorrow for our superior hand-made products and service. To ensure this, we need creative and competent personnel in all business divisions, an intensive exchange of thoughts and ideas with all users, participation in working and study groups within the field of welding technology and intensive cooperation with institutes and universities.

Innovation and quality

Innovation and quality come from being receptive and willing to learn from others. We encourage our people to be creative and take risks in the pursuit of excellence. Innovative practices are deeply rooted in every one of our employees, a philosophy that leads to continuous product development and industry firsts.

Teamwork

Striving for excellence is a commitment that is an integral component of the D/F Culture. Our team of skilled and dedicated employees takes pride in the excellence products they produce. Each of us willingly accepts personal responsibility for meeting our commitments and we hold each other to a high standard of accountability.

Progress

By remaining confident, focused, and persistent in challenging times, we will discover opportunity. Commitment to quality and the pursuit on innovation ensure that D/F Machine Specialties will remain an industry leader for years to come.

Responsibility

We will continually strive to be environmentally responsible and to support the health and safety of our employees, customers, and neighbors. We continue to support the communities in which we operate and the industries in which we participate.

Thank You for Choosing D/F Machine Specialties

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SAFETY MEASURES - **PLEASE READ!**

Welding is not particularly hazardous when certain safety practices are followed. Anyone using this equipment should be thoroughly trained in safe welding practices. Failure to observe safe practices may cause serious injury. Handling welding torches presents no danger if the appropriate safety regulations are strictly adhered to. For example:

• Starting-up procedures must be reserved for those fully conversant with processes relating to arc welding equipment.
• Arc welding can prove damaging to eyes, skin, and hearing! It is therefore imperative that the Accident Prevention Regulations UVV 26.0 and VGB 15 are fully observed and that all protective clothing, eye and ear protectors specified are worn.
• The load data given are maximum limit figures. Overloading will inevitably damage the torch!
• Before changing wear parts, disconnect for the power supply.
• The operating instructions for the individual welding components - e.g. power source, wire feed and cooling unit must be followed.
• Never pull the cable assembly across sharp edges or set down close to weld spatter or on a hot workpiece.
• Those not involved in the welding process should be protected by curtains or partitions from radiation and the danger of being dazzled.
• When handling gas cylinders, consult the instructions issued by the manufacturers and the suppliers of the pressurized gas.
• Workpieces which have been degreased using chlorinated solvents must be sprayed down with clean water before welding starts to avoid the risk of phosgene forming. For the same reason, no degreasing baths containing chlorine must be placed close to the welding point.
• All vapors given off by metals can cause harm and a special warning is attached to lead, cadmium, copper, zinc, and beryllium. If necessary, take appropriate precautions (by providing adequate ventilation or an extraction system) to ensure that the legal maximum levels of toxic concentrations are not exceeded.

For more information, refer to the following standards in their latest revisions and comply as applicable.

• ANSI Standard Z49.1, SAFETY IN WELDING AND CUTTING obtainable from the American Welding Society, 2501 N.W. 7th St., Miami, FL 33125.
• ANSI Standard Z41.1, STANDARD FOR MEN'S SAFETY - TOE FOOTWEAR obtainable from the American National Standards Institute, 1430 Broadway, New York, NY 10018.
• ANSI Standard Z49.2, FIRE PREVENTION IN THE USE OF CUTTING AND WELDING PROCESSES obtainable from the American National Standards Institute, 1430 Broadway, New York, NY 10018.
• OSHA, SAFETY AND HEALTH STANDARDS, 29CRF 1910, obtainable from the U.S. Government Printing Office, Washington, D.C. 20402.
• AWS Standard A6.0, WELDING AND CUTTING CONTAINERS WHICH HAVE HELD COMBUSTABLES obtainable from the American Welding Society, 2501 N.W. 7th St., Miami, FL 33125.
• NFPA Standard 70-1978, NATIONAL ELECTRICAL CODE obtainable from the National Fire Protection Association, 470 Atlantic Avenue, Boston, MA 02210.
• ANSI Standard Z88.2, "Practice for Respiratory Protection" obtainable from the American National Standards Institute, 1430 Broadway, New York, NY 10018.
• ANSI Standard Z87.1, SAFE PRACTICES FOR OCCUPATION AND EDUCATIONAL EYE AND FACE PROTECTION obtainable from the American National Standards Institute, 1430 Broadway, New York, NY, 10018.
• NIOSH, SAFETY AND HEALTH IN ARC WELDING AND GAS WELDING AND CUTTING obtainable from the Superintendent of Documents, U.S. Printing Office, Washington, D.C. 20402.
• American Welding Society Standard AWSF4.1 "Recommended Safe Practices for the Preparation for Welding and Cutting of Containers and Piping That Have Held Hazardous Substances", obtainable from the American Welding Society, 2501 N.W. 7th St., Miami, FL 33125.

IMPORTANT

The D/F torch is famous for the fact that if it is chilled properly, the welder can grab the front of the torch with their bare hand and it will be cold to the touch seconds after welding. With the proper chiller, this can be done even after a 4 hour arc time.

Make certain the cooling water supply is at least the minimum flow rate of 3 quarts per minute (for each inner body), at 40 psi (80 psi maximum) with a 5 gallon reservoir and 15,000 BTU/hr cooling capacity. Gun ratings are affected by shielding gas used, arc time, cooling time and inlet water temperature. Water outlet temperature should not exceed 27°C (80°F). The torch's water out & power cable is not cooled until the coolant has gone through the torch and out the water out & power cable. If water is not flowing through the D/F torch for at least 1 minute prior to striking an arc, when you apply the power and water hits the "hot" water/out & power cable, you will generate steam. Steam can damage the torches internals in seconds causing a leak. It can also blow out the torches water/out & power cable. A flow switch can be installed after the return line ensuring that coolant is present at the return line prior to striking an arc.

When High-Deposition GMAW or extended periods of arc time are used, it is recommended that a liquid chiller be considered with a larger reservoir and a minimum of 30,000 BTU/hr cooling capacity. Precise temperature control maintains the cooling at a constant 13°C (55°F) temperature, thus prolonging the life of the welding equipment and more specifically extending the service life of the gas nozzle and current tip.

A refrigerated liquid chiller for GMAW may be obtained from:

For single torch chillers: Dynaflux - 800-334-4420 - www.dynaflux.com

For multiple torch cooling systems: Koolant Koolers - 800-968-5665 - www.koolantkoolers.com

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INTRODUCTION

The D/F Model TM500 (Tungsten Machine 500 amp) water-cooled barrel is for use in semi-automatic or automatic machine applications of the tungsten inert arc process.

A unique feature of this water-cooled TIG barrel is that the nozzle assembly water chamber and the inner body water chamber are serially connected to each other, thus completely eliminating the need for gaskets or O-rings in the water passage system.

Maximum current rating with thoriated tungsten electrodes is 500 amperes DC straight polarity, and 300 amperes AC; high frequency may be superimposed over standard current on a continuous or intermittent basis.

There are five (5) collets available for use with this machine barrel in sizes .040", 1/16". 3/32", 1/8", and 5/32". The tubular dual collet design provides clamping pressure at two points when the collet is securely fastened.

For further information or help with D/F Machine Specialties products, please visit our web site at www.dfmachinespecialties.com, or consult the factory at 1-507-625-6200.

TABLE 1 - RECOMMENDED SPARE PARTS

ITEM	CODE NO.	MIN QTY.
Gas Nozzle	To Be Selected	1
Tungsten Sleeve	To Be Selected	1
Collet Adapter	15881	1
Spatter Disc	10405	1
Insulation Tube	16475	1
Insulator	16473	1
O-ring	16476	1

DISASSEMBLY

To disassemble the Water-Cooled Barrel, proceed as follows:

1) Remove the forward gas nozzle.

2) Remove the nut which fastened the Water-Cooled Nozzle to the body housing.

3) With a screw driver removed the barrel body holding screws. The upper shell may now be removed from the barrel body.

4) Push the barrel body upward until the milled slots bottom out at service connections. The nylon insulators at the front water hose fittings are now exposed. Push these into the body housing concaves which will expose the interconnection water hose fittings. With a 5/16" open end wrench unscrew the water hose nuts from the water-cooled nozzle body. Following this the body housing may be removed from the inner body.

5) Part replacement may now be performed.

ASSEMBLY

1) To assemble the Water-Cooled Barrel, attach the short interconnection hose assembly to the upper block of the inner body. Connect the long interconnection hose to the fitting at the rear of the front inner body block. It is recommended that at this point a leak test be made by attaching the interconnection hose fittings to the water-cooled nozzle. Apply a water hose to one of the service connections and make a visual inspection for leaks at the two connections made within the inner body assembly.

2) Place the long interconnection hose into the concave of the inner body with it extending outward from the inner body. Place the inner body assembly into the barrel body until it bottoms out at service connections.

3) Insert the two (2) nylon insulating tubes over the interconnection hose fittings.

4) The nylon collar should be in place on the rear of the water-cooled nozzle assembly. It is important that the small hole in the nylon collar be on the lower right hand side as the water-cooled nozzle is connected to the hose fittings. After fastening the hoses, the barrel body should be moved forward until the flat head body screw may be fastened. The water-cooled nozzle may now be pushed back against the barrel body.

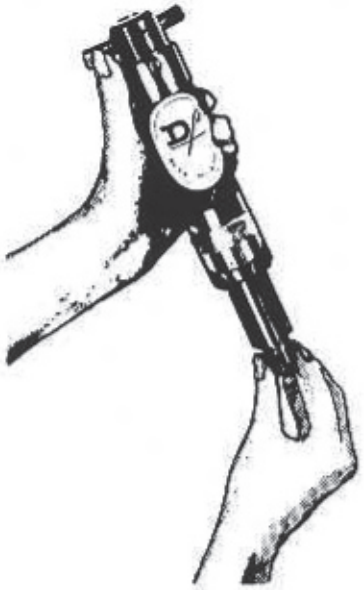
5) Slide upper barrel body shell into place and fasten with screw. The body nut may now be applied.

6) Place the gas diffuser (D/F #15858), with parts facing forward on inner body. Replace insulation tube (D/F #15879) and apply collet adapter (D/F #15914) with wrench supplied.

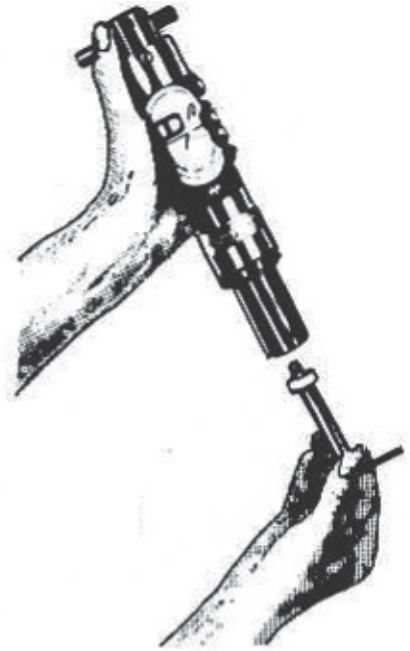
7) Replace the gas nozzle.

NOTE: When replacing the spatter disc (D/F #10405), use wrench supplied (D/F #12111) and unscrew the collet adapter. The spatter disc must be placed on the collet adapter with the counter-bored end facing the front

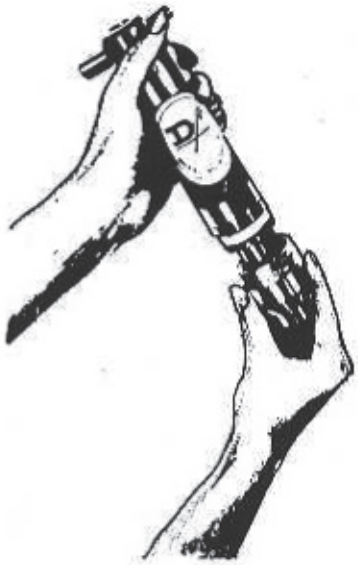
DISASSEMBLY SEQUENCE



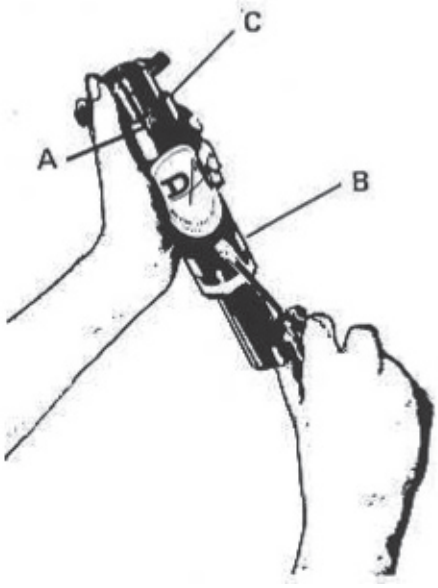
a. Unscrew the gas nozzle



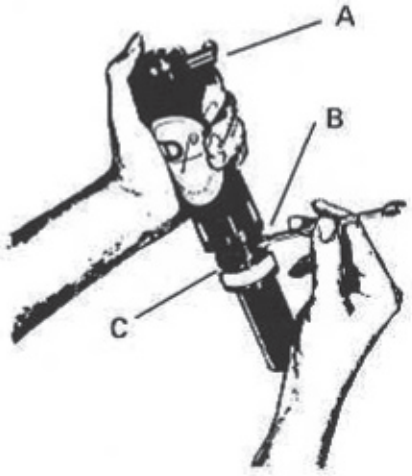
a. Remove the collet adapter and spatter disc with wrench supplied



a. Unscrew the barrel housing nut.



a. With a screw driver remove the slotted screw (A) and (B)
b. Remove the upper shield (C) from barrel housing



a. Slide the barrel housing upward until the milled slots bottom out at service connections (A).
b. Nylon insulation tubes will now be exposed. By pushing the tubes upward into the barrel housing the interconnection water hose nut (B) and (C) attached to the water-cooled nozzle will be exposed.
c. With a 5/16” open end wrench remove (B) and (C).
d. The water-cooled nozzle body may now be removed.

a. Unscrew the barrel housing nut.

REQUIRED TOOLS LIST FOR DISASSEMBLY & ASSEMBLY

1. **D/F 12111 Collet/Tip Wrench** - This is the only tool that should ever be used to tighten the collet adapter. Pressure should be 30 lbs., or as snug as hand tightened. Never use another wrench to apply more torque to this wrench.

3. **Long 5/16" Open Ended Wrench**
   A. A short wrench will work, however we prefer the feel and comfort of the long 5/16" open ended wrench. This is used to loosen or tighten interconnection hoses (10974 & 13971) to the 7mm fitting on the inner body.
   B. Also use this wrench to connect the torch's water-cooled nozzle assembly to the interconnection hoses.

4. **3/8" Open Ended Wrench**
   A. This is used on the inner body's water in hose fitting to secure the water in hose to the torch's inner body. A crescent wrench could be used instead, but due to the large size of crescent wrenches, we prefer the smaller size of the open ended wrenches. You never want to use excessive force by using too large of a wrench. You will use the Long 7/16" Open Ended Wrench for the fitting on the water in hose itself while using the 3/8" wrench to steady the inner body at the fitting. (see #5 A)
   B. This is used on the inner body's gas hose fitting to secure the gas hose to the torch's inner body. A crescent wrench could be used instead, but due to the large size of crescent wrenches, we prefer the smaller size of the open ended wrenches. You never want to use excessive force by using too large of a wrench. You will use the Long 7/16" Open Ended Wrench for the fitting on the gas hose itself while using the 3/8" wrench to steady the inner body at the fitting. (see #5 B)

5. **Long 7/16" Open Ended Wrench**
   A. This is used to secure the water in hose to the torch's inner body. (see #4 A)
   B. This is used to secure the gas hose to the torch's inner body. (see #4 B)

6. **9/16" & 1/2" Open Ended Wrench**
   A. This is used on the inner body's water out & power cable fitting to secure the water out and power cable to the torch's inner body. A crescent wrench could be used instead, but due to the large size of crescent wrenches, we prefer the smaller size of the open ended wrenches. We prefer the use of the larger wrenches on the power cable fitting to ensure that there are no water leaks, and that it has been seated correctly. You will use the #7 (Long 9/16" Open Ended Wrench) for the fitting on the water out & power cable hose. (see #7 A)
   B. This wrench is also used to secure the adapter and jam nut that hold the current tip to the inner body. In your left hand hold the inner body, and with your right hand thread up the adapter using the 1/2" Open Ended Wrench until it is tight. Now place the same wrench on the jam nut and snug it up against the inner body. Keeping that wrench on the jam nut and placing it on the table for force, take #7 (Long 1/2" Open Ended Wrench), place it on the adapter and push it down (counter-clockwise) securing the adapter to the inner body. (see #7 B)

7. **Long 1/2" & 9/16" Open Ended Wrench**
   A. This is used to secure the water out & power cable to the torch's inner body. A medium size adjustable crescent wrench could be used as well. We prefer the use of the larger wrenches on the power cable fitting to ensure that there are no water leaks, and that it has been seated correctly. (see #6 A)
   B. This wrench is also used to secure the adapter and jam nut to the inner body. (see #6 B)
   C. This is used to secure the gas hose to the torch's inner body. A crescent wrench could be used instead, but due to the large size of crescent wrenches, we prefer the smaller size of the open ended wrenches.

8. **Adjustable Crescent Wrench** - A medium size adjustable crescent wrench could be used as well. We prefer the use of the larger wrenches on the power cable fitting to ensure that there are no water leaks, and that it has been seated correctly. **CAUTION:** Never use excessive force with large wrenches, for you could twist or break parts.

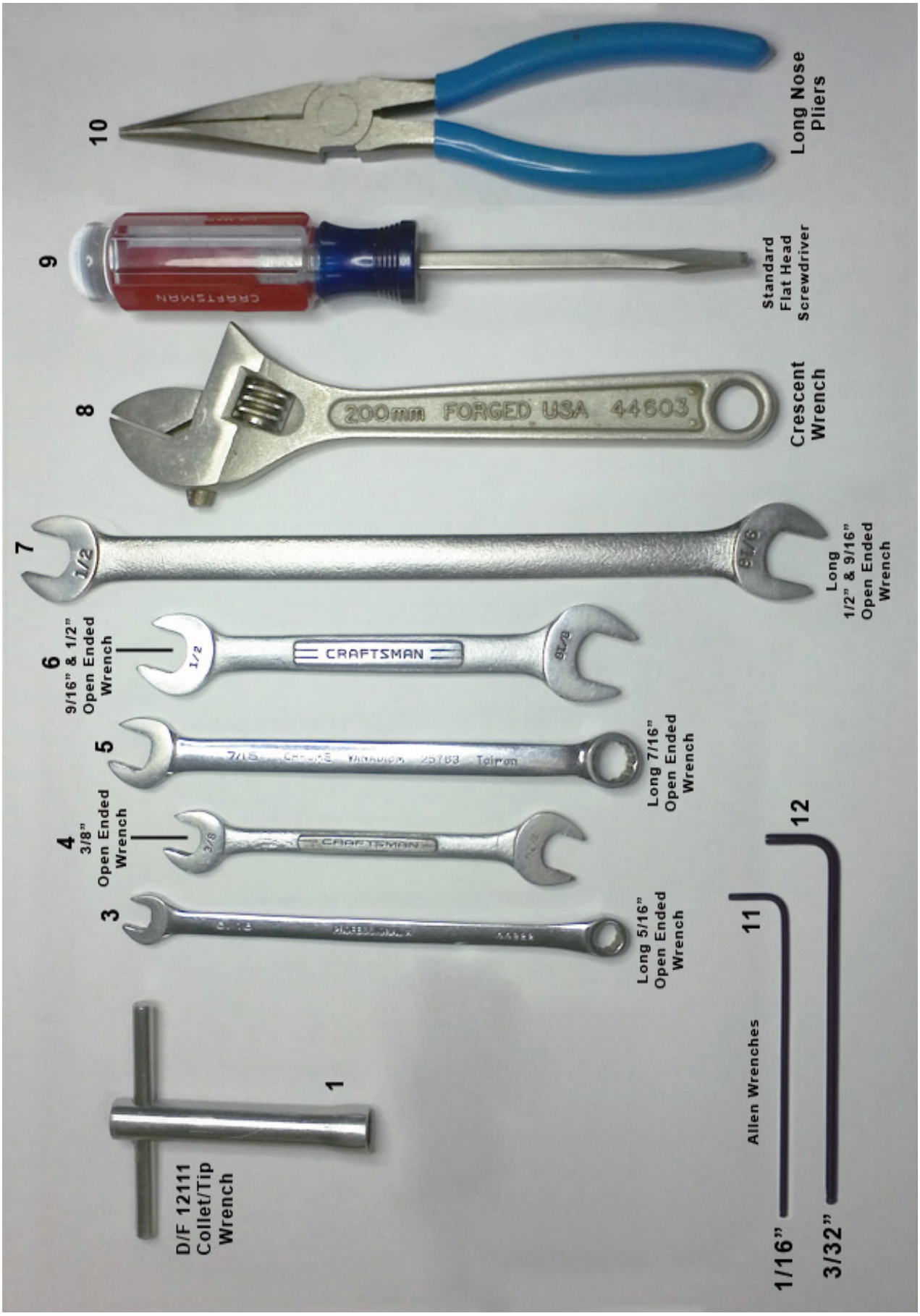
9. **Standard Flat Head Screwdriver** - This is used to tighten or secure the torch's body screw. Also, the screwdriver can be used to straighten the collet adapter if it is not aligned in the center of the gas cup or water-cooled nozzle **CAUTION:** This cannot be done unless the spatter disc has been removed from the torch.

10. **Long Nose Pliers** - These are used to grab the small white insulation tubes (10723) and get them into the correct position when working on the interconnection hose fittings inside the torch. Also they are very handy when changing a slip-in contact tip.

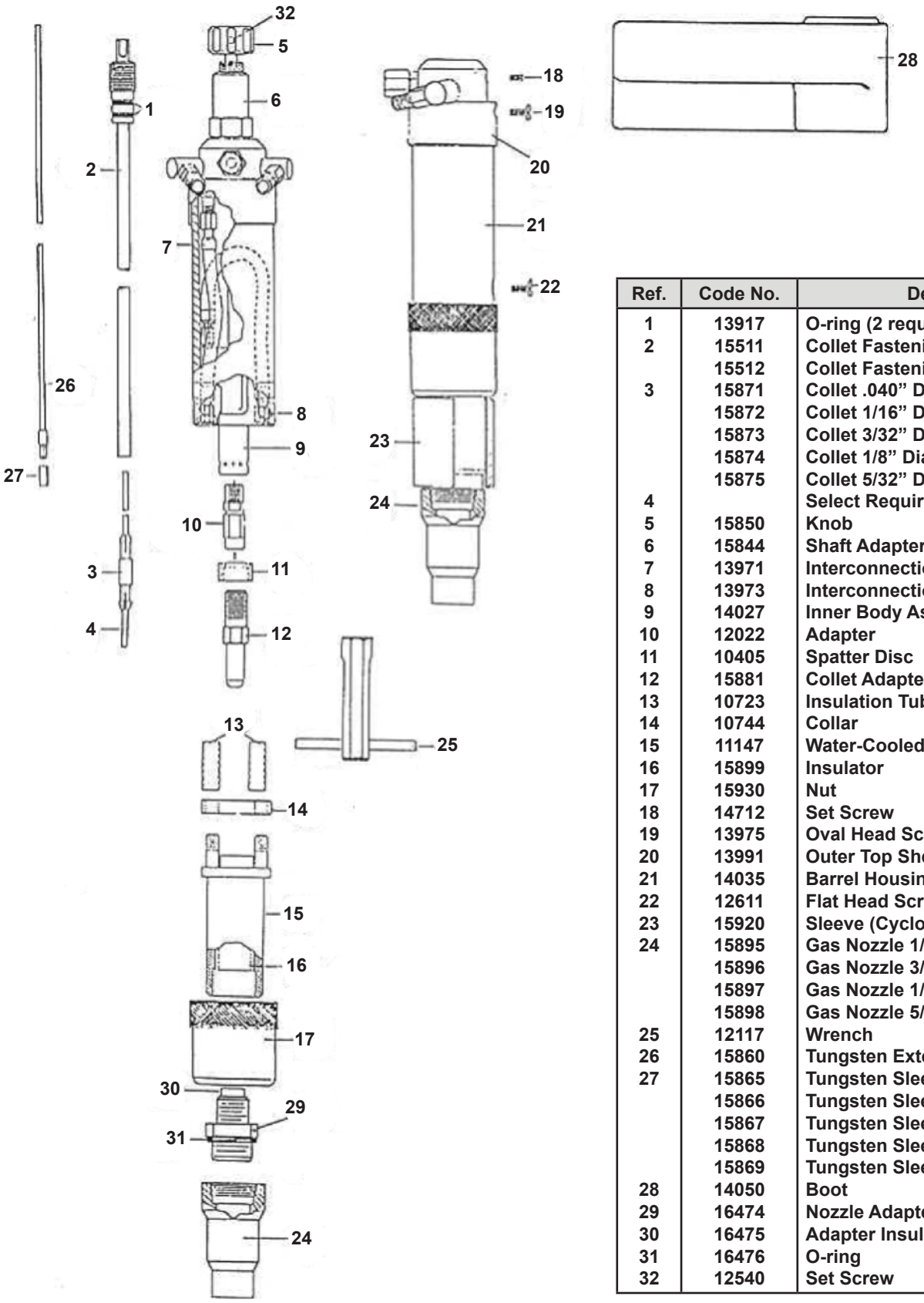
11. **1/16" Allen Wrench** - This is used to secure the socket set screw that holds the knob on the collet fastening shaft.

12. **3/32" Allen Wrench** - This is used to secure the socket cap screw that holds the shaft adapter in the top of the inner body.

REQUIRED TOOLS LIST FOR DISASSEMBLY & ASSEMBLY



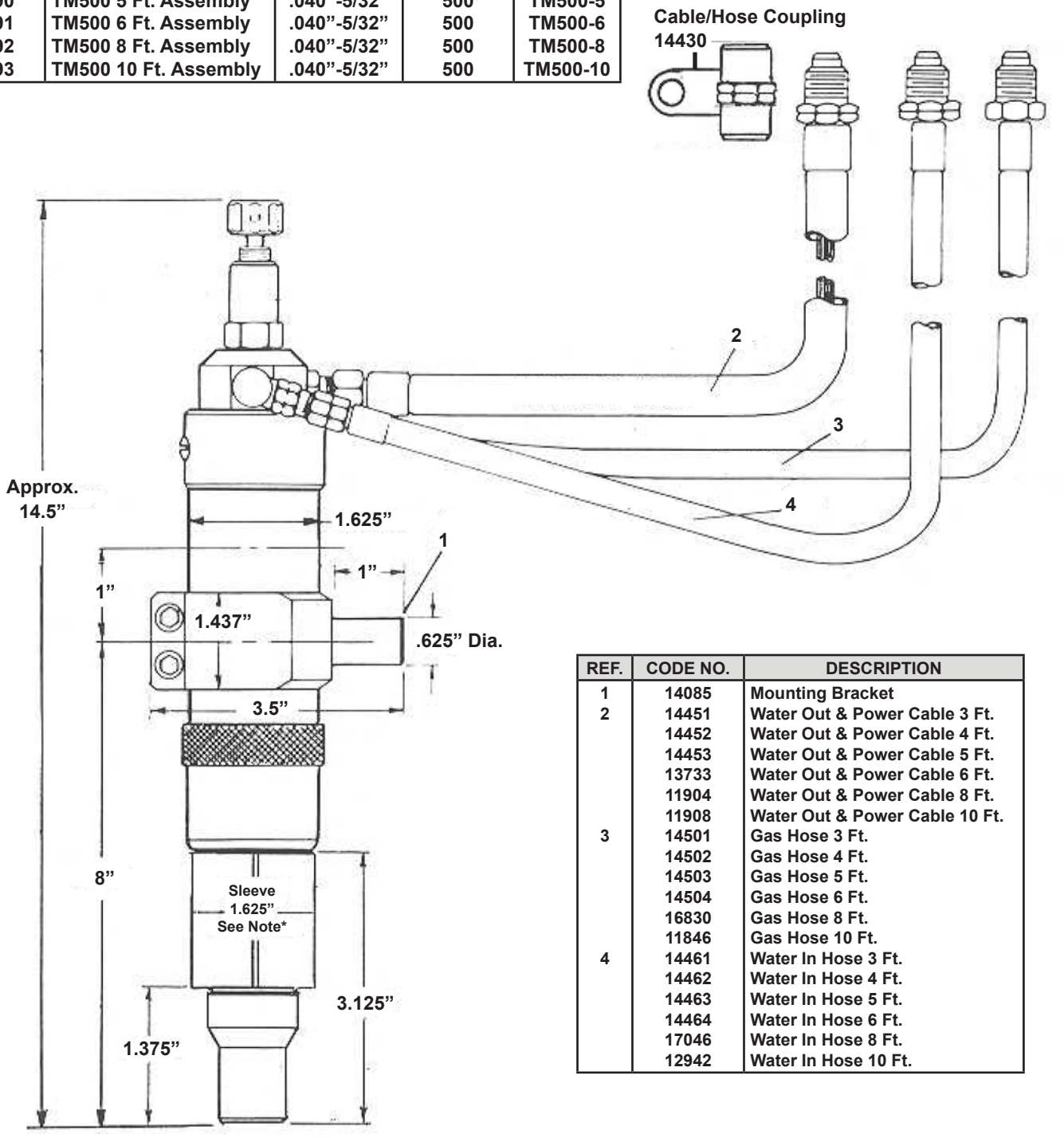
WATER-COOLED TIG BARREL
MODEL TM500 (Code No. 15506)



Ref.	Code No.	Description
1	13917	O-ring (2 required)
2	15511	Collet Fastening Shaft (with Knob)
	15512	Collet Fastening Shaft (less Knob)
3	15871	Collet .040" Dia. Tungsten
	15872	Collet 1/16" Dia. Tungsten
	15873	Collet 3/32" Dia. Tungsten
	15874	Collet 1/8" Dia. Tungsten
	15875	Collet 5/32" Dia. Tungsten
4		Select Required Tungsten Size
5	15850	Knob
6	15844	Shaft Adapter
7	13971	Interconnection Hose (Short)
8	13973	Interconnection Hose (Long)
9	14027	Inner Body Assembly
10	12022	Adapter
11	10405	Spatter Disc
12	15881	Collet Adapter
13	10723	Insulation Tubes (2 required)
14	10744	Collar
15	11147	Water-Cooled Nozzle
16	15899	Insulator
17	15930	Nut
18	14712	Set Screw
19	13975	Oval Head Screw (SS)
20	13991	Outer Top Shell
21	14035	Barrel Housing Assembly
22	12611	Flat Head Screw (Nylon)
23	15920	Sleeve (Cyclomatic Model 4608C)
24	15895	Gas Nozzle 1/4"
	15896	Gas Nozzle 3/8"
	15897	Gas Nozzle 1/2"
	15898	Gas Nozzle 5/8"
25	12117	Wrench
26	15860	Tungsten Extension Rod
27	15865	Tungsten Sleeve .040"
	15866	Tungsten Sleeve 1/16"
	15867	Tungsten Sleeve 3/32"
	15868	Tungsten Sleeve 1/8"
	15869	Tungsten Sleeve 5/32"
28	14050	Boot
29	16474	Nozzle Adapter
30	16475	Adapter Insulation Tube
31	16476	O-ring
32	12540	Set Screw

TM500 MACHINE BARREL MOUNTING

CODE NO.	DESCRIPTION	TUNGSTEN SIZE	CURRENT CAPACITY	MODEL
15288	TM500 3 Ft. Assembly	.040”-5/32”	500	TM500-3
15289	TM500 4 Ft. Assembly	.040”-5/32”	500	TM500-4
15290	TM500 5 Ft. Assembly	.040”-5/32”	500	TM500-5
15291	TM500 6 Ft. Assembly	.040”-5/32”	500	TM500-6
15292	TM500 8 Ft. Assembly	.040”-5/32”	500	TM500-8
15293	TM500 10 Ft. Assembly	.040”-5/32”	500	TM500-10



REF.	CODE NO.	DESCRIPTION
1	14085	Mounting Bracket
2	14451	Water Out & Power Cable 3 Ft.
	14452	Water Out & Power Cable 4 Ft.
	14453	Water Out & Power Cable 5 Ft.
	13733	Water Out & Power Cable 6 Ft.
	11904	Water Out & Power Cable 8 Ft.
	11908	Water Out & Power Cable 10 Ft.
3	14501	Gas Hose 3 Ft.
	14502	Gas Hose 4 Ft.
	14503	Gas Hose 5 Ft.
	14504	Gas Hose 6 Ft.
	16830	Gas Hose 8 Ft.
	11846	Gas Hose 10 Ft.
4	14461	Water In Hose 3 Ft.
	14462	Water In Hose 4 Ft.
	14463	Water In Hose 5 Ft.
	14464	Water In Hose 6 Ft.
	17046	Water In Hose 8 Ft.
	12942	Water In Hose 10 Ft.

*NOTE: Sleeve shown is used with Cyclomatic 4608C Electromagnetic Probe

UTILITY STATION - STANDARD

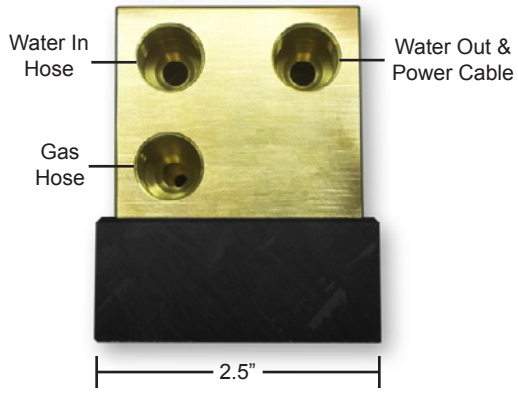
ORDERING INFORMATION

Description	Code No.
Utility Station	45196
Utility Station - Dual Power Cable	45188

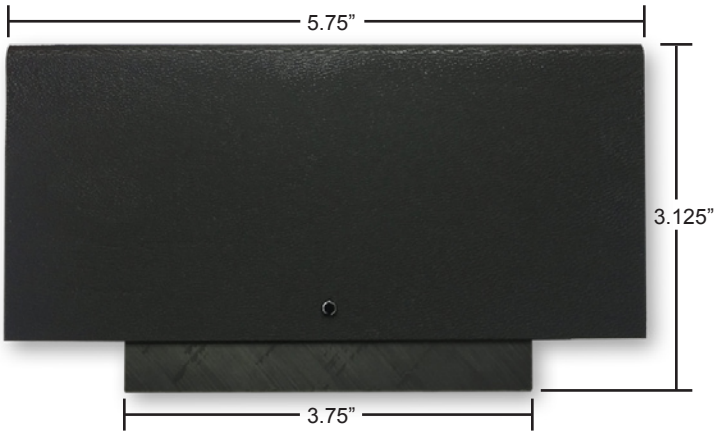
DIMENSION SPECIFICATIONS

Base Length	3.75”
Overall Length	5.75”
Base Width	2.25”
Overall Width	2.5”
Overall Height	3.125”
Mounting Hole Center Distance	2.75”
Overall Weight	3.5 lbs.

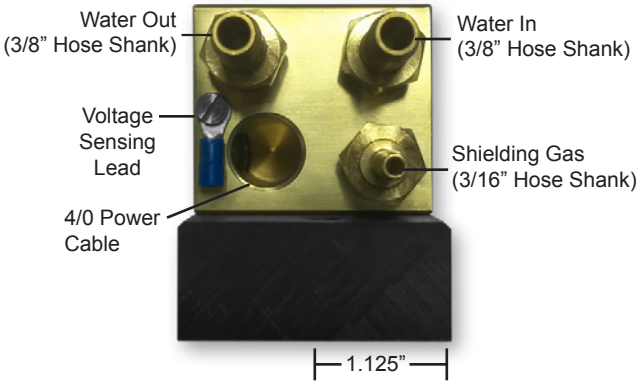
D/F TORCH CONNECTION



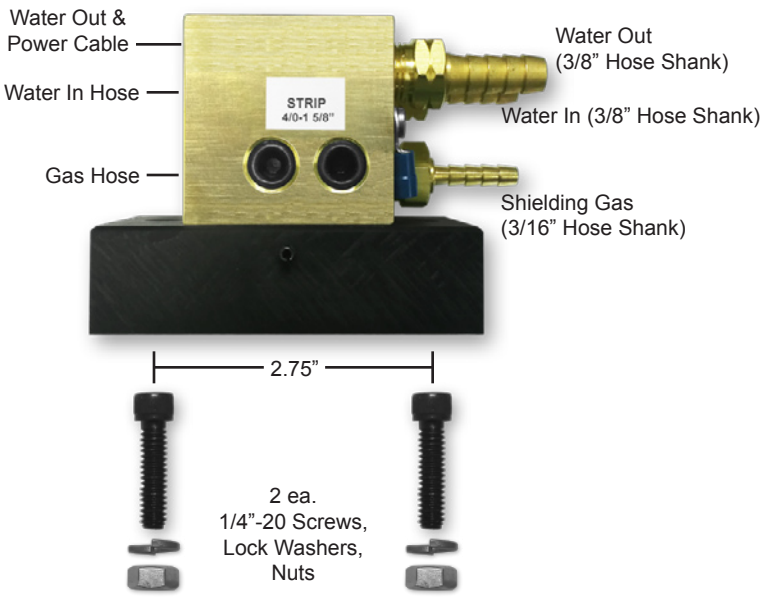
UTILITY STATION SIDE VIEW WITH COVER



CUSTOMER UTILITIES CONNECTION



FROM LEFT: D/F TORCH CONNECTION
FROM RIGHT: CUSTOMER UTILITIES CONNECTION



TROUBLESHOOTING: POROSITY (SUMMARY)

NOTE: Most POROSITY is caused by gas problems, followed by base metal contamination.

Causes of Porosity	Possible Solutions
BASE METAL CONTAMINATION	
Impurities on base metal	a. Remove contamination; clean surfaces b. Use of specific wire/gas mix for specific types of impurities
FILLER METAL CONTAMINATION	
Impurities on filler metal (wire)	a. Replace wire b. Install wire-cleaning system c. Prevent industrial dust/dirt/grit from contaminating wire during storage or use d. Prevent build-up of aluminum oxide on exposed aluminum wire surface by using up quickly e. Remove wire from wire drive unit and store in a sealed plastic bag when not in use for long periods
ATMOSPHERIC CONTAMINATION	
Drafts, wind, fans, etc.	a. Protect weld from drafts (curtains/screens) b. Use tapered or bottleneck gas nozzles when drafts cannot be avoided
GAS MIXING APPARATUS	
1. Too high a gas flow, causing turbulence, and/or sucking air at hose connections; creating the venturi effect at end of gas nozzle	1a. Reduce gas flow 1b. Tighten all hose connection points
2. Too low a gas flow, causing insufficient gas coverage	2. Increase gas flow
3. Damaged or kinked gas lines	3. Repair or replace
4. Too high an oxygen content	4. Adjust mixer
5. Leaks in gas distribution system	5. Repair leaks
6. Other impurities in gas - moisture, etc.	6. Overhaul system; fit filters and/or dryers
7. Inconsistent gas flow (cfh) at the torch connection	7. Regulate pressure into flow meter for consistent cfh delivery of gas
GAS TURBULENCE	
1. Excessive spatter build-up in gas nozzle and on current tip	1. Clean nozzle and tip regularly; spray with anti-spatter fluid
2. Nozzle damage, causing uneven gas coverage	2. Replace nozzle
3. Torch gas ports clogged or deformed	3. Clean or replace
4. Super-heated nozzle, causing shielding gas to expand rapidly and create return effect at end of nozzle	4. Check duty cycle rating of torch
5.Gas diffuser/nozzle insulator missing	5. Replace
6. Too high a gas flow causing the venturi effect	6. Reduce gas flow
WELDING PARAMETERS, ETC.	
1. Too long a wire stick-out; gas nozzle too far from weld puddle	1. Use longer nozzle or adjust stick-out (3/8” minimum or 15 times wire diameter)
2. Bad torch position - too sharp a torch incline causing the venturi effect at the end of the nozzle leading to atmospheric contamination	2. Correct torch angle
3. Excessively wide weld pool for nozzle I.D.	3. Width of the weld pool should be 1.3 times the nozzle I.D.; use suitable wider gas nozzle
4. Arc voltage too high	4. Reduce voltage
5. Too high a travel speed	5. Reduce speed

TROUBLESHOOTING: SPATTER

Problems/Causes	Possible Solutions
SPATTER Too fast or too slow wire feed for the arc voltage	Set the wire feed rate and voltage in accordance with good welding practices as recommended by a qualified welding engineer.
Too long an arc	Adjust the wire feed and voltage so that the arc is in accordance with good welding practice for the joint to be welded. The distance from the current tip to the workpiece should be 15 times the welding wire diameter. If the arc is too long there will be spatter, usually in the direction of the weld.
Damaged current tip	If the current tip becomes worn the welding wire will not be in constant contact with the tip and the arc will become unstable. A current tip contaminated with spatter will cause uneven wire feed resulting in further spatter.
Inclination of welding gun too great	The angle of the gas nozzle relative to the workpiece should be between 45 and 90 degrees. If the angle is too small, the wire runs parallel to the weld pool, resulting in spatter in the direction of the welding.
Faulty power source	Have the power source checked for faulty conditions such as broken wires and faulty contacts.
Incorrect start	A great deal of spatter occurs if the stick-out is too great and if the welding gun is held too far from the workpiece when striking the arc. Try to start with as short a stick-out as possible and with the welding gun as close to the starting point as possible. If a large ball end is formed on the end of the welding wire, remove it by cutting the wire with sharp wire cutters. It is helpful if the wire is cut to a point. Always remove the ball end before striking an aluminum arc. Check the welding ground connection.
Incorrect pulse parameters	Check the user manual for your power supply or consult a qualified welding engineer.
Uneven wire feed	Uneven wire feed gives rise to heavy spatter. Find the cause of the disturbance and correct the condition before proceeding.
Impurities on the base metal	Paint, mill scale, rust and other contamination on the base metal form an insulating layer causing an unstable arc that results in heavy spatter. Clean the surfaces to be welded.
Poor ground contact	Inspect ground cable for loose connections, fraying and cuts. Correct any problem areas found and attach the ground cable directly to the workpiece after having cleaned the contact surface first. POOR GROUND CONTACT IS THE MOST COMMON CAUSE OF UNSTABLE MIG WELDING CONDITIONS.
Too long stick-out (short-arc welding)	The stick-out should be 15 times the diameter of the wire electrode being used. With increasing stick-out, the current is reduced and the arc voltage rises, giving a longer unstable arc and increased spatter.
Incorrect polarity	Check for correct polarity. Follow the electrode manufacturer's recommendations.

TROUBLESHOOTING: GENERAL GUIDE

Problems/Causes	Possible Solutions
ERRATIC WIRE FEED	
Slipping feed rolls	Check that the feed roll size is correct for the wire size being used. Increase the drive roll pressure until the wire feed is even. Do not apply excessive pressure as this can damage the wire surface, causing copper coating to loosen from steel wires or metal shavings to be formed from soft wires like aluminum. These metal fragments or shavings can be drawn into the wire feed conduit and will rapidly clog the liner. When welding with flux-cored wires, excessive drive roll pressure may open the wire seam and allow flux or metal powders to escape.
Clogged or worn gun liner	a. Dust, particles of copper, drawing lubricants, metal or flux and other forms of contamination can all clog the liner so that the wire feed is slowed or impeded. A liner that has been in use for an extended period of time becomes worn and filled with dirt and must be replaced. b. When changing the welding wire, remove the tip from the front end of the gun and blow out the body liner with clean, dry compressed air from the back of the gun. Repeat with the casing and liner assembly. Note: Wear safety goggles when using compressed air to clean the liners. Make sure proper safety procedures are followed in order to avoid possible serious eye injury.
Liners too long or too short	Check the lengths of the liners and trim or replace if too long or too short. The efficient feeding of the welding wire is dependent on the liners fitting correctly.
Spatter on the wire	An unprotected coil of wire quickly collects dust and other airborne contamination. If grinding is being performed in the vicinity, particles can become attached to the wire, severely interfering with the wire feed. Replace with clean wire and keep it protected with a cover. Make sure spare wire rolls are stored in a clean, dry place.
Coil brake incorrectly adjusted	Set the brake so that the coil immediately stops rotating as soon as welding is interrupted. If the brake is applied too hard it will cause the feed rolls to slip, resulting in uneven wire feed. If it is too loose, overrun of the wire will occur, causing wire tangles, inconsistent tension on the feed mechanism and irregular arc characteristics.
UNSTABLE ARC	
Incorrect setting of voltage and/or current	Set the wire feed in relation to the arc voltage in such a way that the arc is stable and burns evenly. In spray arc welding, set the wire feed so that there are no short circuits and the filler metal is transferred in a spray across the arc. Find the cause of the interference and correct it. (See ERRATIC WIRE FEED above)
Problems in wire feeding: worn current tip	When the internal diameter of the current tip becomes worn from the passage of wire through it, the wire may no longer stay in continuous electrical contact with the tip. This results in an unstable arc and an increase in spatter. Paint, mill scale, silicon scale, rust or flux deposits from previous weld runs may form an insulating layer causing an unstable arc. Clean the surfaces to be welded.
Impurities on the base metal	Securely attach the ground cable as close to the point of welding as possible on the workpiece. Clean the surfaces thoroughly to ensure good contact.
Poor contact between ground cable and workpiece or loose power connection	Check to insure the welding power connection on the power source is tight, the and workpiece. Connection on the wire feeder is tight, the connection to the adaptor block is tight, Loose power connection and the connection of the gun to the adaptor block is tight.
Stick-out too long	Adjust the current tip to work distance to a minimum of 3/8” for short arc welding. A more precise distance is 15 times the wire diameter.

TROUBLESHOOTING: GENERAL GUIDE

Problems/Causes	Possible Solutions
AIR-COOLED GUN RUNNING TOO HOT	
Poor ground	Inspect ground cable for loose connections, fraying and cuts. Correct any problem areas found. Clean clamping area to insure good contact. Securely attach the ground cable to the workpiece, as close as possible to the point of welding. Make sure there is a good connection to the welding power source.
Loose power connection	Check to make sure the power connection on the power source is tight, the connection on the wire feeder is tight, the connection to the adaptor block is tight, and the connection of the gun to the adaptor block is tight.
Consumable items loose or worn	Remove nozzle from gun and inspect current tip, collet nut (tip holder) and spatter disc (gas diffuser) for wear and tightness; replace or tighten as necessary.
Capacity of gun being exceeded	Note complete weld parameters, including welding current (Amps), welding voltage, wire feed speed, type and size of wire, type of gas and flow rate of gas and consult your local Authorized D/F Machine Specialties Distributor or contact the factory.
Dirty connection	Remove torch and inspect parts for dirt build-up. Periodic cleaning is necessary.

D/F MACHINE SPECIALTIES, INC.

MIG & TIG Welding Products, Consumables & Accessories

WARRANTY

This Equipment is sold by D/F MACHINE SPECIALTIES, Incorporated, under the warranty set forth in the following paragraph. Such warranty is extended only to the buyer who purchases the equipment directly from D/F or its authorized distributor as new merchandise.

The barrel and cable assemblies are warranted by D/F to be free from manufacturing defects for 90 days after delivery by D/F, provided that the equipment is properly operated under conditions of normal use and that regular periodic maintenance and service is performed. Expendable parts are not warranted for any specific time. Expendable parts referred to herein would be the nozzles, current tips, spatter discs, insulators, casing liners, and wire inlets. D/F's sole obligation under this warranty is limited to making replacement at its manufacturing facility for barrel assemblies which are returned to it with transportation charges prepaid, and upon D/F's examination have been found to be so defective.

Genuine D/F MACHINE SPECIALTIES, Inc. Parts, Accessories, and Consumables must be used for safety and performance reasons. The use of anything other than genuine D/F MACHINE SPECIALTIES, Inc. Parts, Accessories, or Consumables will void this Warranty. All units returned for warranty repair are subject to Warranty Inspection. Warranty and repair work shall not apply to goods that have been altered or repaired, have been subject to misuse or used while any parts are loose, broken, or damaged, or used with other than original D/F® parts, consumables, or accessories which may affect performance and safety.

D/F MACHINE SPECIALTIES, INC.
1750 Howard Drive
North Mankato, MN 56003
Phone: (507) 625-6200
Fax: (507) 625-6203
www.dfmachinespecialties.com

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